Northwest Africa 4819

Anorthositic (polymict) regolith breccia

234 g

Figure 1: Slice through NWA 4819 with 1 mm scale bars below (photo courtesy of R. Korotev).

Introduction

Northwest Africa 4819 was found in 2007, and consists of a 234 g stone with some fusion crust. Weathering products are visible along a network of thin fractures. In general, though, the stone is dark and fine grained with only a few clasts that exceed 1 mm in diameter (Connolly et al., 2008).

Petrography, mineralogy, and chemistry

The lithic clasts present in NWA 4819 include anorthosites, anorthositic norites (orthopyroxene = $Fs_{35.4}Wo_{4.3}$ and plagioclase = $An_{96.5}$), gabbros, and troctolites (olivine = $Fa_{28.1}$; FeO/ MnO = 105; pigeonite = $Fs_{26.9}Wo_{5.9}$; FeO/MnO = 54; and plagioclase = An_{97}). There are also shock melt clasts. Of particular interest is a large amount of homogeneously distributed FeNi metal (kamacite mean Ni = 6.2, Co = 0.77 wt% and taenite Ni - 8.2 - 23.6 wt%). and troilite, as well as a large amount of pyroxene (Connolly et al., 2008). INAA analyses of small (275 mg) chip yields FeO = 7.0%, Ni = 290 ppm, Sm = 3.4 ppm, Th = 1.5 ppm, Ir = 12 ppb. This composition resembles some Apollo 16 regolith soils (Korotev et al., 2008). Additionally, it represents one of a small group of lunar meteorite whose bulk composition falls outside of the range expected for a simple binary mixture of KREEP and feldspathic end members, indicating that there may be a major fourth chemical component that is being sampled by this group of meteorites (Figure 2; Korotev et al., 2009a).

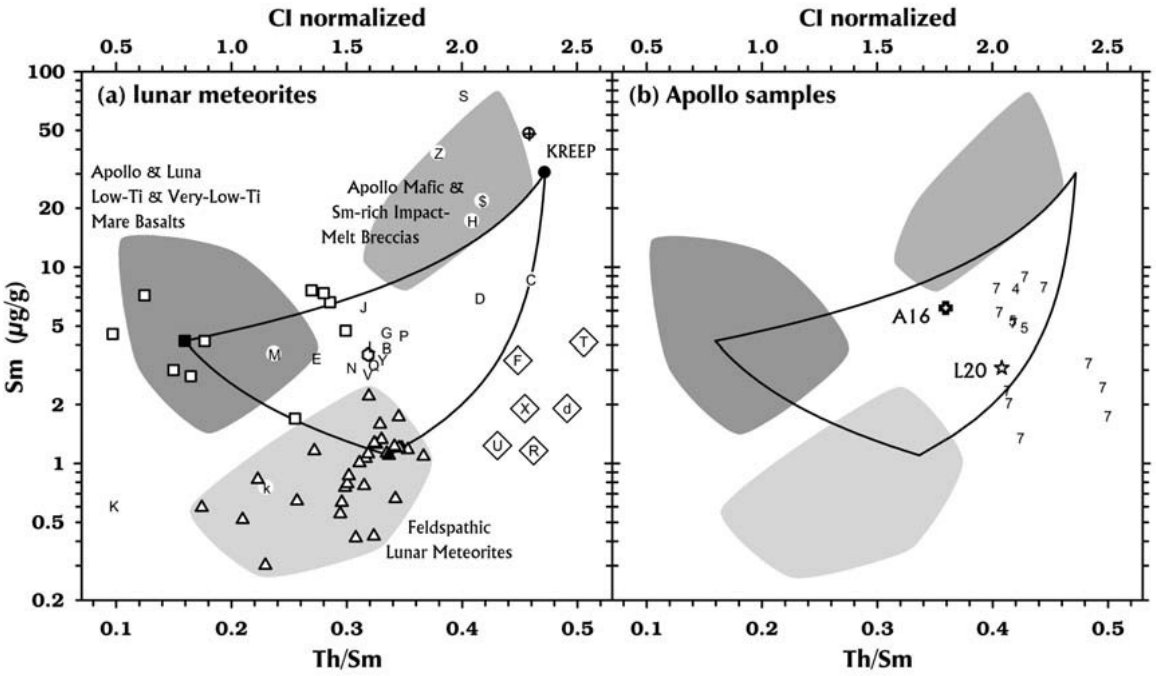

Figure 2: NWA 4819 (diamond symbol labeled F in figure) is among a small group of polymict brecciated lunar meteorites that falls outside a simple binary mixture of KREEP and feldspathic end members, indicating that there may be a major fourth chemical component that is being sampled by this group of meteorites (from Korotev et al., 2009b). [Dhofar 925[d], NWA 4819[F], NWA 4932[R], SaU 300[U], SaU 449[X], and Yamato 983885[T])]

Radiogenic age dating and Cosmogenic isotopes and exposure ages

None yet reported.

Table 2a:Chemical composition of NWA 4819

reference	1	1
weight	20-60	275
technique	a	c
SiO_2 %	46.4	
TiO_2	0.35	
Al_2O_3	22.1	
FeO	7.03	7.03
MnO	0.1	
MgO	7.41	
CaO	16	14.9
Na_2O	0.36	0.363
K_2O	0.15	<0.5
P_2O_5	0.08	
S %		
sum	100.2	
Sc ppm		13
V		
Cr		1420
Co		27.8
Ni		288
Cu		
Zn		
Ga		
Ge		
As		<1
Se		<1
Rb		<6
Sr		203
Y		
Zr		103
Nb		
Mo		
Ru		
Rh		
Pd ppb		
Ag ppb		
Cd ppb		
In ppb		
Sn ppb		
Sb ppb		
Te ppb		
Cs ppm		0.13
Ba		158
La		7.52
Ce		19.5
Pr		
Nd		11.4
Sm		3.36
Eu		0.824
Gd		
Tb		0.71
Dy		
Ho		
Er		
Tm		
Yb		2.65
Lu		0.366
Hf		2.76
Ta		0.34
W ppb		
Re ppb		
Os ppb		
Ir ppb		11.9
Pt ppb		
Au ppb		4.1
Th ppm		1.5
U ppm		0.46

technique (a) EMPA, (b) ICP-MS, (c) INAA (d) XRF

Table 2b. Light and/or volatile elements for NWA 4819

Li ppm		
Be		
C		
S		
F ppm		
Cl		
Br	1.4	
I		
Pb ppm		
Hg ppb		
Tl		
Bi		

References: 1) Korotev et al. (2009b)